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An Empirical Examination of Reverse Auction Appropriateness in B2B Source Selection

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An Empirical Examination of Reverse Auction Appropriateness in B2B Source Selection

Abstract

Electronic reverse auctions (e-RA) are perhaps the most revolutionary development in the procurement arena to date. Their cost-reducing capabilities are unmatched; as such, their use is expected to grow. To optimize their use, sourcing professionals will need to match firm requirements to market characteristics and supplier capabilities through the application of optimal *sourcing strategies*. To date, explanations for the phenomenon of why sourcing managers decide to utilize reverse auctions are incomplete. This study relies upon strategic sourcing concepts coupled with theories of competition, goal-setting, and leadership to develop a conceptual model of antecedents to *appropriateness* of e-RA usage. The model is tested and supported via structural equations modeling. Managerial implications and future research directions are identified.

Keywords: reverse auction, sourcing strategy, leadership, specifiability, competition

An Empirical Examination of Reverse Auction Appropriateness in B2B Source Selection

Since Kraljic's (1983) seminal article of how and why purchasing must become supply management, firm leaders have looked to purchasing to contribute to competitive advantages through cost leadership and differentiation (Ellram and Carr 1994; Monczka 1992; Reck and Long 1988). Cost leadership originates from the obvious purchase price reduction, but more importantly, from the reduction in total costs of ownership, or lifecycle costs (Ellram and Siferd 1998). Differentiation can result from the strategic alignment of capabilities, resources, and vision among supply partners. In fact, strategists suggests that in the future, firms will compete not as individual entities, but as supply chain versus supply chain (Martin and Towill 2002; Rice and Hoppe 2001). "Suppliers play a critical role in supporting a firm's competitive strategy, whether it be cost leadership, differentiation, or a mixed strategy (Ellram and Carr 1994, p. 17)." The purchasing function serves as the link between the firm and its suppliers. Supply chain alignment materializes through appropriate sourcing strategies. A highly effective strategic sourcing tool that has been rapidly and widely adopted is an electronic reverse auction (e-RA). This study explores factors that determine whether an e-RA is an appropriate sourcing tool.

An e-RA is an online, downward bidding event linking buyers and sellers in real time. In this online market, buyers post bid schedules of products or services it is purchasing (or plans to purchase over a prescribed timeframe), and multiple sellers bid to win the business and become the buyer's supplier. In many cases, the e-RA is replacing traditional, asynchronous, paper-based or email-based requests for proposals (RFP) and subsequent face-to-face negotiations.

There is a compelling case for using e-RAs due to its ability to reduce the costs of purchased goods and services. The savings from this revolutionary sourcing process can range

from 5-40% (Tully 2000), with an average of 15-20% gross savings being more typical (Cohn 2000). "This is a significant reduction in the cost of purchased material, which, in turn, directly reduces the cost of goods sold" (Emiliani 2000, p. 177), considering that manufacturers typically spend 55% of their revenue on purchased goods and services (Monczka, Trent and Handfield 2002).

The body of literature on e-RAs is not yet established (Carter et al 2004; Wagner and Schwab 2004). Furthermore, research specific to the factors that influence e-RA use is almost nonexistent (Joo and Kim 2004). Indeed, only four studies address antecedents to the adoption of business-to-business electronic markets. Joo and Kim's (2004) study revealed that external pressure, such as competition and firm size, directly affected e-marketplace adoption. Kaufmann and Carter (2004) published the most recent analysis of e-RA antecedents via case study wherein several factors contributed to determining the mode of auction negotiation. Factors included: 1) specifiability, 2) attractiveness of the auction, 3) degree of rivalry among suppliers, 4) trust in the new process/system, 5) and ethics. The Center For Advanced Purchasing Studies (CAPS) conducted case study interviews with e-RA providers, buyers, suppliers, and non-users (Beall et al. 2003). This study suggested that a sourcing strategy determines whether an e-RA should be used. From the widely used strategic sourcing matrix (Kraljic 1983), Beall, et al. (2003) identified three of the four categories of spend as eligible for e-RA sourcing: "*non-critical*," "*leverage*," and "*bottleneck*." Only "*strategic*" spend was excluded – due primarily to the long-term nature of contracts, fluid requirements, and de-emphasis of price. Finally, Wagner and Schwab (2004) found that available time-to-auction, competition, and specifiability increased the probability of e-RA success.

Disparate policies across companies and philosophies across individual sourcing professionals result in different conclusions as to the appropriateness of an e-RA to source a particular product/service. Overall, firms employ e-RAs to source less than 5% of the total value of their purchased products/services (Beall et al. 2003). Procurement policies from the METRO Group and Volkswagen (Beall et al. 2003) hold that any procurement is susceptible to e-RA sourcing, while some companies (e.g. IBM) prohibit their use entirely. Between these two extremes, a definitive appropriateness determination is plagued by tremendous variance across sourcing professionals' perspectives.

Each of the four relevant studies, while advancing our knowledge base about e-RAs, is incomplete from both a theoretical and an operational perspective. Alone, none of the prior research completely explains the phenomenon, nor does it identify all of the variables that a sourcing professional must examine when deciding to source via e-RA. Existing empirical research is silent as to the role of senior leadership in e-RA usage, and has not considered differing degrees of appropriateness of e-RA usage. Based on a review of the literature and applicable behavioral science theories, a complete framework/model of decision drivers is yet to be developed and tested.

The purpose of this research is to empirically test a set of factors that purport to determine whether an e-RA is an appropriate sourcing strategy. This test includes the predominant antecedents suggested previously in qualitative and quantitative research, and is complemented by leadership and motivational factors hypothesized herein. With the criticality of purchasing effectiveness to firm performance (Ellram and Carr 1994; Ittner et al. 1999), the enormous savings potential offered by e-RAs (Cohn 2000), and alleged negative attitudes of e-RAs from suppliers (Emiliani and Stec 2005; Jap 2003), sourcing professionals must be able to

discern when and how to effectively source via the e-RA tool. Additionally, researchers and practitioners must know whether e-RA use should be restricted to sourcing requirements conducive to price-based selection criteria.

The remainder of this article is organized as follows. First, hypotheses are described to include construct definitions and proposed relationships. Next, the study methodology is explained followed by results of the analysis. Finally, a summary of substantive managerial implications and recommendations for further research is provided.

HYPOTHESES

RA Sourcing Strategy Appropriateness

A *sourcing strategy* is a very complex construct, somewhat unclear in the purchasing literature to date. It is determined by an assessment of the market characteristics (e.g. structure, risk, complexity) and product/service characteristics, and culminates in the population of the strategic sourcing matrix found in Figure 1 (Kraljic 1983).

-- insert Figure 1 about here --

Note that in the proposed framework, market characteristics are operationalized by the construct *competition*, and product/service characteristics are operationalized by their *specifiability*. The resultant strategy will determine all of the salient features of the supplier selection process and post-contract-award relationship. Although not an exhaustive list, the strategy determines how to procure the requirement, from whom, in what quantity, the duration and type of supplier relationship, the type of supplier performance evaluation, the contract type, and terms and conditions. To demonstrate how the sourcing professional's decision is operationally derived through the sourcing process, Figure 2 displays the task relationships of these and other elements of a sourcing strategy. The firm's deliberate sourcing strategy will determine whether an e-RA is

an appropriate and effective means of sourcing the specific products or services. This decision must consider the many components of a sourcing strategy; therefore, the decision is quite complex and subjective. As such, *RA sourcing strategy appropriateness* should be operationalized on a continuum to accommodate differing degrees of appropriateness.

-- insert Figure 2 about here --

Competition

Support for *competition* may be found in three pinnacle studies by: CAPS Research (Beall et al. 2003); Smeltzer and Carr (2003); and Kaufmann and Carter (2004). Beall et al. interviewed GSK and identified another key driver in a decision whether to use an e-RA - whether there is a sufficient number of suppliers willing to participate. An appropriate supply market must exist. In other words, there must be a sufficient number of suppliers (bidders) to stimulate competition. According to Beall et al. (2003), e-RAs are most appropriate for sourcing *non-critical* items and services (Reference Figure 1.) where competition is plenty, product characteristics are homogenous and price is the determining criteria in sourcing decisions. As evidenced, e-RA use is a complex decision; thus, sourcing professionals need to have the market knowledge and sourcing expertise in order to use e-RAs effectively and appropriately. As such,

> H1: The greater the competitive market structure, the greater the appropriateness of an e-RA as a sourcing strategy.

Specifiability

In the sourcing strategy development process, the sourcing professional must fully understand the internal customer's requirement to be purchased. Although not an all-inclusive list, key information includes the volume of the product or service, where it is needed, when it is needed, for what purpose it is needed, its physical characteristics, how it must or can be transported, storage details, the major cost drivers of its production, manufacturing techniques,

specialized labor requirements, service frequency, quality standards, inspection requirements, required delivery dates, performance metrics including minimum performance thresholds, production lead times, supply chain risks, warranty details, intellectual property rights, and the product or service's contribution to profitability. It is important to note that the use of an e-RA requires that all of the requirements of the product or service be thoroughly and unambiguously specified (Kaufmann and Carter 2004). This was termed "specifiability" by Kaufmann and Carter. It means that not only must the sourcing professional be able to clearly express the need, but each supplier's interpretation of the need must match that of the sourcing professional. This required common understanding of work enables the "apples-to-apples" comparison of bid prices. Additionally, the requirement must be sufficiently (but not completely) invariable to permit fixed pricing. It does not, however, limit RAs to standard products or true commodities. Thus,

> H2: The greater the specifiability of a requirement, the greater the propensity to adopt an e-RA sourcing strategy.
>
> H3: The greater the specifiability of a requirement, the greater the competition stimulated in the market.

Selection Criteria

Another key component of the sourcing strategy that influences the sourcing professional's decision to source via e-RA is the *selection criteria* to be used in choosing the successful supplier. Often, firms do not select suppliers on price alone; non-price factors are also considered. Depending on the nature of the requirement, non-price factors may be significantly more important than price. While the e-RA is highly suited to a price-only selection criterion, it is not confined to that scenario. The e-RA may also be integrated into a face-to-face negotiation process. This was termed an "auction-integrated sourcing process" by

Kaufmann and Carter (2004). Here, the e-RA may be used solely to determine the price in a low-price-technically-acceptable source selection methodology. In other words, technical approaches, performance levels, or other material technical aspects of the offeror's proposal could not be efficiently and dynamically traded up (down) for increased (decreased) prices using an e-RA. The technology exists in current e-procurement software; however, its use is quite complex beyond practicality for sourcing professionals and suppliers (Kaufman and Carter, 2004). Although the e-RA is a versatile sourcing tool that may be integrated within many source selection methodologies (Kaufmann and Carter 2004), some researchers posit that its use is restricted to items and services whose selection criteria is predominantly price (Schrader et al. 2004). Hence,

> H4: The predominance of price as a selection criteria will positively influence the use of an e-RA as a sourcing strategy.
>
> $H4_{alt}$: The predominance of price as a selection criteria is not related to the use of an e-RA as a sourcing strategy.

Aside from the sourcing strategy that determines the appropriateness of a requirement for sourcing via e-RA, there are human factors in the decision equation as well. Such factors include the degree of *leadership emphasis* and the *sourcing professional's motivation.*

Leadership Emphasis

Leadership Emphasis follows House and Mitchell's path-goal theory of leadership (1974), and is defined as the extent that executive decision makers support and promote the use of e-RAs in sourcing requirements. The path-goal theory of leadership, whose major tenets are on-target (Chemers, 1997), explains that influencing behaviors demonstrated by leaders supporting e-RA usage affect a sourcing professional's motivations. Influencing behaviors are characterized as directive, supportive, participative, or achievement-oriented. The leader

clarifies the subordinate's behavior (path) that will lead to the desired rewards (goals), then backs it with demonstrative behavior. Leadership behaviors comprising this *leadership emphasis* construct may include: 1) setting aggressive annual and quarterly dollar-value goals or percentage-of-spend goals for e-RA sourcing, 2) apportioning funds and establishing a contract with an e-RA service provider for auctioning services, the auctioning software, or auctioning consulting services (often termed market making), 3) staffing an e-sourcing manager to coordinate and orchestrate bidding events and to train suppliers and internal customers, 4) integrating e-RAs into the firm's documented procurement processes and project plans, and 4) financially or otherwise rewarding those sourcing professionals who meet or exceed e-RA sourcing objectives. According to a CAPS Research report, "if formal leaders are committed to the e-sourcing...process, there is a greater likelihood of rapid adoption and full utilization" (Flynn, 2004, p. __). Commonly, such leadership emphasis comes from senior positions such as the firm's Chief Procurement Officer or Director of Supply Chain Management. It is therefore posited that:

> H5: There will be a direct, positive relationship between leadership emphasis to source via e-RA and the sourcing manager's motivation to do so.

Sourcing Professional Motivation

The construct *Sourcing Professional Motivation* considers whether or not the periodic performance appraisal of the sourcing professional (i.e. the individual who makes the decision to source via a e-RA) includes the objective measures of cost savings. Implied here is that for purchasing organizations that set and communicate specific cost savings goals at the beginning of an evaluation period, sourcing professionals will internalize these goals as their own, then act toward their achievement. Goal-setting theory is relied upon to support this hypothesis. Therein, Locke and Latham (1990) established that an individual's personal goals are an

immediate regulator of his or her actions. Furthermore, Bandura and Wood (1989) found that externally-set performance standards influenced individual's self-set goals such that more difficult standards yielded higher self-set goals. Therefore, there is a direct link between externally-set performance standards (e.g., cost savings targets) levied by the firm and an employee's motivation to achieve the goals. Since e-RAs can significantly reduce costs, and since many performance/reward structures include assessments of cost reduction, it is posited that:

> H6: The sourcing manager's motivation (through the firm's established performance standards) will directly and positively affect perceptions of e-RA appropriateness.

The proposed model attempts to explain the sourcing professional's assessment of the appropriateness of e-RA use for sourcing specific requirements. The principle arguments are that: (1) a reverse auction is an appropriate sourcing methodology in certain circumstances, and inappropriate in others, (2) that specifiability not only renders an e-RA appropriate, but also enhances competition, and (3) that the path-goal theory of leadership is helpful in explaining e-RA use. The aforementioned hypotheses are depicted in the model (Figure 3).

-- insert Figure 3 about here --

METHODOLOGY AND RESULTS

Sampling Procedures

A significant challenge in empirically examining this topic is identifying and accessing the population of sourcing professionals who use e-RAs. Whereas probability sampling is desired for its protective moat from sampling bias, and thus external validity, only a snowball sample was feasible. A solicitation to assist in the research was delivered via email directly to the purchasing vice presidents or chief procurement officers from a list of Fortune 500 firms based in the United States and to seven employees of a military retail organization known to use

e-RAs. Of the 507 invited, 258 confirmed receipt and 50 agreed to participate. The purchasing executives from the 50 companies collectively agreed to distribute the survey invitation to a total of 486 of their sourcing professionals, the unit of analysis for this study. Respondents were required to have experienced an e-RA procurement transaction, and to have been involved in the decision to use the e-RA. 150 responses (145 usable) were received yielding a 29.8% response rate. This response rate is consistent with rates reported for web-based surveys (Dillman 1999), and with other logistics research (Larson 2005). Responses represented a diverse yet balanced representation of industries (Table 1). Statistical tests using multiple discriminant analysis suggested that no demographic (gender, e-RA experience, years of purchasing experience, criticality of the purchase, or type of purchase) biased the sample. Additionally, reported transactions (Table 2) were diverse representing direct material, indirect material, capital equipment and services. Finally, a broad spectrum of procurement dollar values are represented from $785 to $300 million (mean $12M; std dev $32M; median $2M).

-- insert Table 1 about here –

-- insert Table 2 about here --

Respondents averaged 9.8 years' purchasing experience. 29.7% self-reported as novice e-RA users (fewer that five e-RA bidding events), 33.8% identified themselves as experienced (five to nine e-RA bidding events), and 36.6% were expert users (more than 10 e-RA bidding events), offering a near-perfectly even distribution of e-RA experience.

A fundamental threat to external validity is the sample's degree of representation of the population. Researchers suggest that where the response rate is less than 40%, examination of non-response bias is necessary (Lambert and Harrington 1990), and that a comparison of responses from early and late respondents serves as an effective method to detect non-response

bias (Armstrong and Overton 1977). Non-response bias was tested by dividing the data into quartiles according to the time it was received. A comparison using multiple discriminate analysis of the first to the last quartile yielded no significant difference in mean scores across the survey's 22 salient items. Likewise, a similar comparison of quartiles two and three found no statistical difference. This indicates the absence of non-response bias.

Notwithstanding, the survey design enabled the assessment of response bias from faulty information. One survey item was reverse coded (Churchill 1979) and one was duplicated. Additionally, the survey included comments fields inviting respondents to elaborate on or justify their responses. Four responses were deleted due to extreme differences in ratings for the duplicate question. One response was deleted due to inexperience with e-RA use divulged in the comments field. Thus, the final sample size used for analysis became 145. Responses were absent in three data elements overall. Each missing data point was accommodated via mean substitution since the missing data was determined to be completely at random (Hair et al. 1998).

Measures

As evidenced by the literature review, quantitative research specific to e-RAs and sourcing strategies is sparse. Likewise, no existing scale appropriately measures three of the six constructs, as defined. Due to space constraints on the questionnaire, and because of the narrowly-tailored application of the path-goal leadership and goal-setting theories, simplified measures were developed for the two constructs, *leadership emphasis* and *sourcing manager motivation*, rather than using typical leadership scales such as the Form XII from the Ohio State Leader Behavior Description Questionnaire (Stogdill 1965).

Each a-priori construct included five items, each measured with a seven-point Likert-type rating scale. A panel of doctoral candidates pre-tested the initial survey instrument. Following modification, the survey was reviewed by e-sourcing managers from two Fortune 500 firms who are acknowledged leaders in e-RA utilization. Additionally, an academic supply chain expert reviewed the survey. Their positive feedback reinforced the content validity, and resulted in the measurement scale found in Appendix 2.

Measure Assessment

Through iterative scale purification (Churchill 1979), the 39 items reduced to 22 across six a-priori constructs. Exploratory factor analysis (Appendix 1) with Varimax rotation and a standard of eigenvalues greater than 1.0 yielded three distinct predictor variables. These measures, in addition to measures of the outcome constructs, proved to be sufficiently reliable with final coefficient alphas ranging from 0.71 to 0.82, above the minimum acceptable threshold of 0.7 (Nunnally 1978). Reliability is a necessary but not sufficient condition for statistical inference (Churchill 1979). Validity is also required, and the data firmly exemplifies this property via three investigations. First, item inter-correlations did not exceed the reliability estimates (Churchill 1979). Additionally, more than 90% of the within-factor correlations exceeded the between-factors correlations simultaneously supporting convergent and discriminate validity. Third, an examination of each of the six single-factor structures via structural equations modeling yielded supportive fit indices (Table 3). Significant parameter estimates loading on the intended factors suggests convergent validity (Anderson and Gerbing 1988). These analyses indicate acceptable levels of reliability, convergent, and discriminate validity.

-- insert Table 3 about here --

RESULTS OF HYPOTHESIS TESTING

As in the measurement models, LISREL version 8.54 computed maximum likelihood estimations of parameter values based on the variance/covariance matrix. Prior to interpreting the parameter coefficients, adequacy of fit between the data and the hypothesized model is necessary. A global assessment of fit indices (Bagozzi and Yi 1988) displayed in Table 4 suggests that the measured data is a good fit to the model. Whereas the chi square statistic is significant (χ^2(129d.f.) = 168.4, $p<0.0017$) suggesting a difference between the data and the model, problems associated with using the chi square statistic to measure goodness of fit render its utility questionable (Fornell 1983). Conversely, other fit indices support the model. Bentler and Bonnet's normed fit index is 0.91, and Bentler's comparative fit index is 0.97, both above the recommended 0.9 level. Additionally, the goodness of fit (0.88) and adjusted goodness of fit indices (0.84) closely approximate the "rough guideline" of 0.9 (Bagozzi and Yi 1988, p. 79).

Note that during model estimation, two pairs of epsilon error terms were permitted to correlate due to methodological reasons such as a common data collection bias (Bagozzi 1983). However, per the restrictions on error term correlations (Bagozzi 1983), these two correlated errors neither significantly (0.05 alpha level) altered the measurement nor the structural parameters. Further, the number of allowed correlated errors were minimized. Finally, the allowed covariances did not exceed the factor loadings. In conclusion, the general sufficiency of fit of the model to the data permits further analysis of parameter estimates, and hence, hypothesis testing.

-- insert Table 4 about here --

Table 4 displays the results of the structural equations modeling procedure per the model in Figure 1. Significant support was found for all hypotheses, excluding H4 (the effect of selection criteria on RA strategy appropriateness). Specific results are as follows:

- H1: Consistent with expectation, the degree of competition in the market for the purchased goods/services positively influenced the appropriateness of a RA sourcing strategy ($t = 2.88$, $p<.05$).
- H2: The hypothesis that the ability to clearly specify the salient requirements of a purchased good/service will positively influence RA sourcing strategy appropriateness was supported ($t = 3.65$, $p<.05$).
- H3: As predicted, specifiability also promotes competition in the market for the goods/services ($t = 5.18$, $p<.05$).
- H4: There was no support for the hypothesis that predominantly price-based selection criteria directly affect RA sourcing strategy appropriateness ($t = 1.0$, $p>1.0$).
- $H4_{alt}$: Since selection criteria was found not to relate to RA sourcing strategy appropriateness, this alternate hypothesis is supported.
- H5: Leadership influence had a significant positive impact on the sourcing professional's motivation to use a RA ($t = 2.91$, $p<.05$).
- H6: The hypothesis that the sourcing manager's motivation to use a RA impacts the appropriateness of a RA as a sourcing strategy was supported ($t = 2.96$, $p<.05$).

The structural equations reveal that 53% of the variance in the focal endogenous variable, e-*RA strategy appropriateness,* is explained by a combination of *specifiability* and the two paths: *leadership*-to-*motivation* and *specifiability*-to-*competition.* Finally, Table 5 displays the means, standard deviations, reliability estimates, correlations, and covariances of all seven constructs.

-- insert Table 5 about here --

DISCUSSION AND CONCLUSIONS

The purpose of this study was to build upon and empirically test the findings of previous qualitative and quantitative research regarding the appropriateness of an e-RA sourcing tool in corporate purchasing. This study is the first known empirical test of the factors determining *appropriate* e-RA use in source selection, the first to acknowledge differing levels of

appropriateness of e-RA use, and the first to apply structural equation modeling to the e-RA phenomenon.

Managerial Implications

The wide support for the hypotheses yields helpful insights to academicians and sourcing practitioners. As expected, greater competition leads to a greater perception of the e-RA as an appropriate sourcing mechanism. e-RA success hinges on sufficient competition to conjure aggressive supplier pricing in a transparent, real-time bidding event. Therefore, sourcing professionals should communicate with prospective suppliers prior to the bidding event to garner interest and identify the maximum number of suppliers. Emphasis must be placed on identifying *capable, qualified* suppliers such that unqualified suppliers are not allowed to artificially inflate the suppliers' perception of competition. Furthermore, sourcing professionals should reconsider source-restricting design specifications and performance requirements, especially where user requests are unnecessarily restrictive for the purposes of artificially directing the award decision.

Although the competitiveness of the market receives the most attention in the literature as a key determinant of e-RA usage and success, this research uncovered a more important factor in e-RA appropriateness. The specifiability of a product/service was found to increase the appropriateness of e-RA use – more so than did competition. Specifiability facilitates an "apples-to-apples" comparison of offers. In e-RA sourcing, a greater understanding of requirements by the prospective suppliers is necessary, and the electronic environment somewhat hinders full and open communications more readily available in traditional face-to-face negotiations.

Specifiability was found to serve another important role in e-RA sourcing; it enhances greater competition. In other words, unambiguous requirements lead to greater participation of

suppliers in e-RA bidding events. This is extremely important since the degree of success (or failure) hinges on the stimulation of sufficient competition among suppliers willing to reduce costs and/or margins to win the business. The surveyed sourcing professionals, on average (std dev 1.2), indicated that a minimum of four suppliers are necessary to conduct an e-RA. Additionally, sourcing professionals should apply extra effort in acquisition planning, particularly project plan development, to allocate sufficient time and resources to ensure the product/service specifications and performance thresholds are crystal clear and not misinterpretable.

Also of interest is the lack of a relationship between predominantly price-based selection criteria and e-RA strategy appropriateness. While counterintuitive, support for the alternative hypothesis suggests that contrary to allegations of e-RA critics (Emiliani and Stec 2002), e-RA use may, in fact, be appropriate for non-price-based source selections. Further evidence for this conclusion is available simply by examining a list of the products/service procured in the sample of 145 e-RA transactions (Table 2). The sample included complicated requirements such as consulting and logistics services. Hence, where the technical requirements, supplier's capabilities, experience, past performance, and technical approach are more important than price, the e-RA is readily employed as an effective sourcing medium. Such a non-price based source selection could result from pre-qualifications where non-price factors are evaluated for acceptability prior to the bidding event, or in emerging full trade-off, best-value source selections where price is dynamically bid along with weighted non-price factors and/or offered performance levels. The important take-away for practitioners is not to be dissuaded by the myth that e-RAs are restricted to price-based sourcing. Rather, e-RAs can be successfully integrated into more complicated source selections. Therefore, a greater proportion than 5% of

the firm's spend is likely eligible for e-RA sourcing opening the door to significant additional savings potential.

This study also supports the application of the path-goal theory of leadership (Houses and Mitchell 1974) to e-RA use. Apparently, where leaders advocate e-RA usage as the appropriate path to achieve the sourcing professional's desired goal(s), sourcing professionals' motivation will increase. Consequently, they will respond by adopting the e-RA sourcing tool as an appropriate sourcing venue. These findings suggest that corporate and sourcing executives should emphasize and reward e-RA usage where it is an appropriate tool for the particular procurement.

The supported hypotheses have direct implications to the daily actions of sourcing professionals. Additionally, they further explain the phenomenon of decisions to utilize e-RAs in procurement. According to Beall et al. (2003), the use of e-RAs will persist; their use is expected to grow by ten to 15% per year. Approximately 56% of large companies use reverse auctions (Reese and Baitler 2005), and on average, only 5% of spend is sourced through them. Given the continued demand for e-RA sourcing, it will be imperative that sourcing professionals have the ability to analyze their appropriate application. A model is presented here that aids the assessment of the appropriateness of e-RA usage. It provides an operational prescription for the use of e-RAs that is packaged within the context of the strategic sourcing strategy development process. Additionally, the proposed model provides direction for executive leadership by suggesting that a leader's behavior, objective goal-setting, and subsequent performance appraisal of sourcing professionals lead to appropriate e-RA usage. This is important as e-RAs clearly can have a significant impact on the financial performance of the firm by reducing the costs of goods sold, and therefore leadership will want its sourcing professionals to utilize e-RAs to the

maximum appropriate extent. In addition to providing a supported descriptive and normative model, a multi-item measurement scale is provided (Appendix 2). This contribution will facilitate future research involving the following constructs: e-RA strategy appropriateness (new scale), specifiability (first muli-item scale), price-based selection criteria (new scale), leadership (simplified scale), and motivation (simplified scale).

Study Limitations

This study of a complex model was not without challenges. First, the research design relied upon self-reported data from respondents. Where two or more constructs are measured by self-reports, the data may be contaminated by common method variance (Podsakoff and Organ 1986). Second, the response rate of 29.8% is contingent on accurate reporting from each company's focal point of contact. For example, if a purchasing executive reported that they would send the survey invitation to ten employees, then actually sent it to more or fewer, the response rate would be inaccurate. Third, without a random sample, a response bias is possible where the company point of contact is permitted to determine, based on undiscoverable criteria, the survey recipients. Fourth, the sample included only large, Fortune 500 businesses. Generalizations are therefore limited to large firms' use of e-RAs. Finally, the marginal GFI and AGFI indices coupled with the proportion of explained variance (though notable for social science research) suggest that a variable may have been omitted from the model. Nonetheless, the overall satisfactory results may suggest that the model represents the most parsimonious explanation of e-RA strategy appropriateness, a central tenet of theory development and testing (Whetten 1989).

Future Research Priorities

Further research is needed to explore whether our finding of competition enhanced by the specifiability of the requirement generalizes to non-e-RA procurements. Hence, does specifiability enhance competition regardless of sourcing methodology? Additionally, further research should empirically explore the consequences of e-RA use. This is at the center of much debate (Carter et al. 2004; Emiliani and Stec 2002; Hartley et al. 2004; Jap 2003) as to whether e-RAs are beneficial or detrimental and to which part of the supply chain dyad. As mentioned above, one such consequence may be superior financial performance. e-RAs might also affect satisfaction. Whereas we might expect e-RA usage to positively affect buyer satisfaction and negatively affect supplier satisfaction, further research is needed to explore under what conditions the inverse is true. A third potential consequence may be the effect of repeatedly using a margin-squeezing sourcing media on supplier trust and commitment. Finally, consequences such as effects on sourcing professionals' negotiating skills and the degree of procurement outsourcing could be explored.

Conclusion

In summary, the e-RA tool development and employment, aside from the advent of electronic data interchange, is perhaps the most significant advancement in the realm of corporate procurement. Due to its extraordinary ability to leverage competition and yield substantial returns, e-RA use will continue to grow. There is much at stake for buyers, suppliers, and third-party auctioneers who must act and react to remain competitive. For this reason, researchers (Smeltzer and Carr 2002) urge empirical research in the realm of appropriate e-RA application. This study responds to that call. The proposed model will help sourcing professionals optimize e-RA usage to deliver a competitive advantage. Additionally, the unique measurement scales developed should facilitate refinement/extension of this model, in particular,

and test of tangential procurement research in general. Further knowledge discovery in purchasing and supply chain management will enhance our understanding of firm competitiveness and success.

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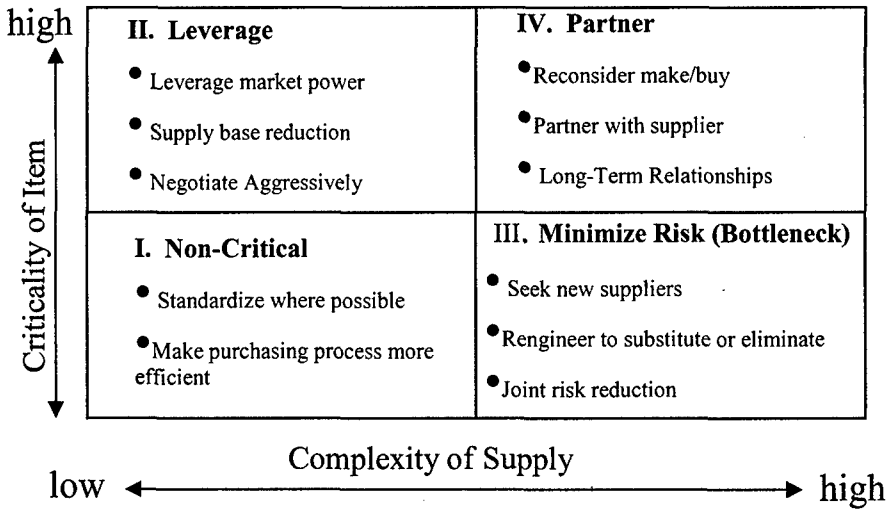
FIGURE 1
STRATEGIC SOURCING MATRIX



Adapted From: Kraljic, P. (1983), "Purchasing Must Become Supply Management." *Harvard Business Review*, Vol.61, No.5, pp. 109-117.

FIGURE 2
STRATEGIC SOURCING GANTT

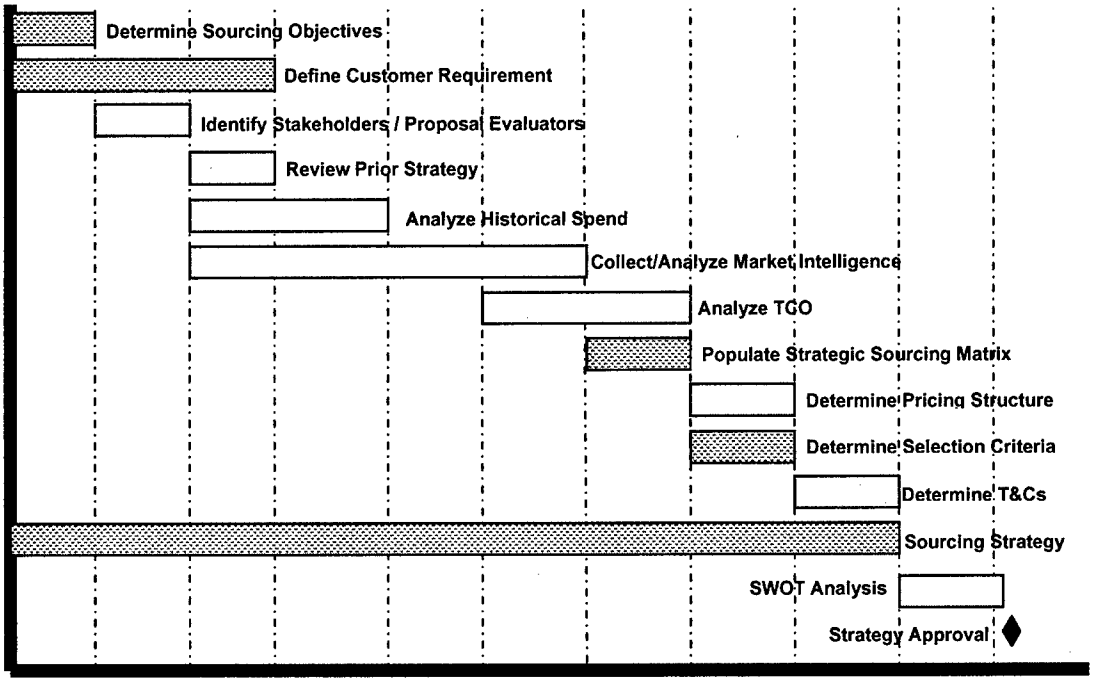


FIGURE 3
STRUCTURAL MODEL OF DETERMINANTS OF REVERSE AUCTION APPROPRIATENESS IN B2B SOURCE SELECTION

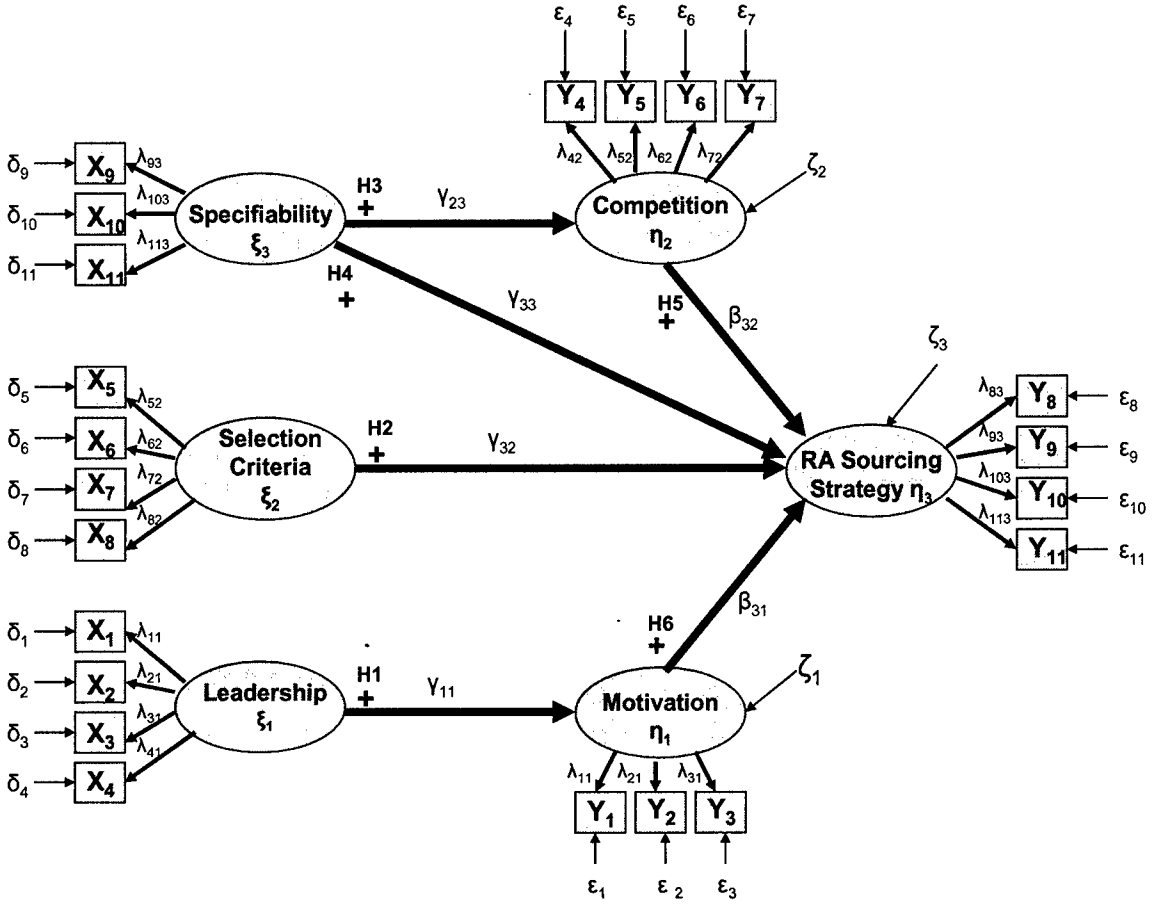


TABLE 1
INDUSTRIES REPRESENTED

Industry	Percentage of Responses
Travel/Hospitality	1
Transportation	2
Military	2
Telecommunications	5
Healthcare	5
Energy	6
Other	6
Food/Apparel	8
Computers	11
Finance/Banking	11
Manufacturing	18
Consumer Prod/Retail/Wholesale	23

TABLE 2
PRODUCTS/SERVICES VARIETY

Description	Description
Autos	Compact V2 Out Door Cabinet
Plastic Cups	Armored Car Services
Collections agencies	Supermarket Shelving System
Point of sale authorization terminals	Multifunction Devices – Managed Print
Direct Mail Components (Envelopes, etc.)	Server Tapes
Specialty Millwork	Software Upgrade
Data Processing	3rd Party Magnetic Stripe Readers
Plastic Credit Cards	Cut-sheet Paper
Electricity meters	Security Guards
IBM p. series servers	Professional Services
Cafeteria/Employee Breakroon Equipment	Life Insurance/Accidental Death
Meters	Chemicals - Caustic
Leasing Equipment	Office Supplies
Direct Services to meet customer rqmts	Chemicals
Security Guard Services	Personal Computers
Sheetmetal chasis	Packaging
Transportation	Personal computers
Transportation	Molded Plastic Components
Office Suppliers	Transportation
Energy - Electricity	Plastic Resins
Office supplies	Displays
Cable assemblies	Drilling Service
Corrugate Packaging	Casework/built-ins for our store
Printing paper	Blisters
Retail boxes	HDPE Pipe
Retail Air Conditioners	Soft packaging
Janitorial Paper Supplies	Plastic Injection Molding
Aircraft Batteries	Insurance
Meeting and Events	Temp labor, recruitment, etc
Corrugate Shippers	Beef
Airbag	4oz Developer Bottles
Gasoline	Ingredients
Trade Show Services	Macromedia Software
Harnessing	Frozen Strage

TABLE 3
MEASUREMENT SCALES: RELIABILITY, FACTOR STRUCTURE (LISREL) DIAGNOSTICS, AND MEASUREMENT MODEL DIAGNOSTICS

			Single Factor Structure Diagnostics							
Construct	**Reliability**	**χ^2(df)**	**p-value**	**RMSR**	**GFI**	**AGFI**	**CFI**	**NFI**	**IFI**	**RMSEA**
Leadership	0.76	3.83 (2)	0.18	0.026	0.99	0.94	0.99	0.99	0.99	0.069
Selection Criteria	0.78	8.09 (2)	0.049	0.16	0.97	0.86	0.97	0.96	0.97	0.15
Specifiabiltiy[a]	0.82									
Motivation[a]	0.71									
Competition	0.82	3.54 (2)	0.025	0.056	0.99	0.94	0.99	0.99	0.99	0.073
RA Strategy Approp.	0.80	2.32 (2)	0.31	0.023	0.99	0.96	1.00	0.99	1.00	0.033
			Measurement Model Diagnostics							
Measurement Models										
Exogenous Latent Variables (ξ)		55.96 (41)	0.0598	0.062	0.93	0.89	0.98	0.92	0.98	0.05
Endogenous Latent Variables (η)		53.88 (41)	0.086	0.053	0.94	0.90	0.98	0.94	0.98	0.047

[a]Represented By 3 Items - Fully Saturated

TABLE 4
TEST OF HYPOTHESES: ESTIMATES OF STRUCTURAL EQUATIONS MODEL

Structural Equations:

1. $\eta_1 = 0.37\xi_1 + \zeta_1$
2. $\eta_2 = 0.63\xi_3 + \zeta_2$
3. $\eta_3 = 0.07\xi_2 + 0.41\xi_3 + 0.22\eta_1 + 0.34\eta_2 + \zeta_3$

Parameters	Path		Standardized Estimate	t-value
Leadership (ξ_1)				
LDRSHP1 (X1)	λ_{11}		0.35	4.00
LDRSHP4 (X2)	λ_{21}		0.74	9.69
LDRSHP3 (X3)	λ_{31}		0.88	12.18
LDRSHP2 (X4)	λ_{41}		0.81	10.95
Selection Criteria (ξ_2)				
SELCRIT1 (X5)	λ_{52}		0.61	7.48
SELCRIT2 (X6)	λ_{62}		0.48	5.63
SELCRIT3 (X7)	λ_{72}		0.83	10.62
SELCRIT4 (X8)	λ_{82}		0.82	10.55
Specifiabiltiy (ξ_3)				
SPEC1 (X9)	λ_{93}		0.73	9.50
SPEC2 (X10)	λ_{103}		0.90	12.67
SPEC3 (X11)	λ_{113}		0.66	8.37
Motivation (η_1)				
MOTIV1 (Y1)	λ_{11}		0.42	
MOTIV2 (Y2)	λ_{21}		0.40	5.14
MOTIV5 (Y3)	λ_{31}		1.12	3.36
Competition (η_2)				
MKTSTCR1 (Y4)	λ_{42}		0.56	
MKTSTCR4 (Y5)	λ_{52}		0.71	8.36
MKTSTCR5 (Y6)	λ_{62}		0.64	5.65
ATTRV2 (Y7)	λ_{72}		0.83	6.38
RA Strategy (η_3)				
SRCOBJ3 (Y8)	λ_{83}		0.91	9.17
SRCOBJ4 (Y9)	λ_{93}		0.66	
SRCSTRA2 (Y10)	λ_{103}		0.93	9.25
ACTRET1 (Y11)	λ_{113}		0.41	4.60
Tests of Hypotheses				
Competition to RA Strategy Approp.	β_{32}	H1	0.34	2.88
Specifiability to RA Strategy Approp.	γ_{33}	H2	0.40	3.65
Specifiabilty to Competition	γ_{23}	H3	0.63	5.18
Selection Criteria to RA Strategy Approp.	γ_{32}	H4	0.07 **[NS]**	1.04
Leadership to Motivation	γ_{11}	H5	0.36	2.91
Motivation to RA Strategy Approp.	β_{31}	H6	0.21	2.96
Global Model Fit Diagnostics				
χ^2 (*df*)			180.98 (129)	
p-value			0.0017	
χ^2 / *df*			1.40	
RMSEA			0.053	
IFI			0.97	
GFI			0.88	
AGFI			0.84	
RMSR			0.081	
Bentler and Bonett's NFI			0.91	
Bentler's CFI			0.97	
Critical N			130.76	

Notes: See Figure 1 for a visual representation of parameters. **[NS]** Not Significant.

TABLE 5
CORRELATION MATRIX

Constructs		Mean	SD	1	2	3	4	5	6
Leadership	1	19.83	5.89	(0.76)	**2.42**	**3.48**	**6.94**	**1.53**	**.835**
Selection Criteria	2	15.23	5.77	0.07[a]	(0.78)	**1.52**	**2.51**	**0.57**	**5.15**
Specifiability	3	15.74	3.95	0.15[a]	0.07[a]	(0.82)	**2.06**	**9.27**	**11.49**
Motivation	4	14.91	4.37	0.27	0.10[a]	0.12[a]	(0.71)	**5.09**	**7.81**
Competition	5	22.20	4.89	0.05[a]	0.02[a]	0.48	0.24	(0.82)	**13.00**
RA Strategy Appropriateness	6	19.76	5.81	0.02[a]	0.15[a]	0.50	0.31	0.46	(0.80)

Note: Diagonal elements in parentheses are Cronbach's Alphas. The lower diagonal elements are intertrait correlations of summated scales. The upper diagonal elements (bold) represent the covariance matrix. [a] Denotes nonsignificant ($p>.05$) correlations; all others are significant at $p<.05$.

APPENDIX 1
EXPLORATORY FACTOR ANALYSIS – INDEPENDENT VARIABLES

Factor	1	2	3
1. **Selection Criteria**			
SELCRIT1	0.841		
SELCRIT2	0.824		
SELCRIT3	0.767		
SELCRIT4	0.666		
2. **Leadership**			
LDRSHP2		0.878	
LDRSHP3		0.839	
LDRSHP4		0.794	
LDRSHP1		0.566	
3. **Specifiability**			
SPEC1			0.866
SPEC2			0.858
SPEC3			0.816
Percentage of Variance Explained	60.801	61.79	73.13
Factor Mean	15.23	19.83	15.74
Factor Std Dev	0.479	0.490	0.328
Cronbach Alpha	0.78	0.76	0.82

APPENDIX 2
MEASUREMENT SCALE

Label	Dimension/Items[ab]	Cronbach's Alpha
	RA Strategy Appropriateness (I=5, F=4)	0.80
SRCSTRA2	Based on our sourcing strategy, a reverse auction was the best means to source our requirement.	
SRCOBJ3	A reverse auction was the best means to achieve our sourcing goals.	
SRCOBJ4	It would have been difficult to achieve our goals without the use of a reverse auction.	
ACTRET1	I used a reverse auction because the projected savings exceeded the cost of the auction.	
	Leadership (I=5, F=4)	0.76
LDRSHP1	To what extent did company leaders or managers influence your decision to source using a reverse auction?	
LDRSHP2	My leaders push for increased use of reverse auctions.	
LDRSHP3	Leadership (e.g. CEO, COO, CPO, Commodity Director, Supply Chain Mgr) strongly encourages reverse auction use.	
LDRSHP4	Leadership establishes periodic (e.g. annual, quarterly) goals for using reverse auctions.	
	Specifiability (I=5, F=3)	0.82
SPEC1	On a scale of 1 – 7, to what extent was it possible to communicate all technical or performance requirements/specifications to the suppliers completely with little risk of supplier mis-interpretation?	
SPEC2	For the reverse auction, suppliers completely understood all performance requirements.	
SPEC3	For the reverse auction, the chance of a supplier misinterpreting the requirements was very low.	
	Competition (I=5, F=4)	0.82
MKTSTCR1	On a scale of 1 – 7, please assess the amount of competition (i.e. the number of qualified, viable, capable suppliers) in the market-space for this item/service.	
ATTRV2	A sufficient number of suppliers wanted to win my business.	
MKTSTCR4	There is ample competition in the market for these items/services.	
MKTSTCR5	If our supplier for the auctioned items/services is not performing to standards, we can find another supplier.	
	Motivation (I=5, F=3)	0.71
MOTIV1	My company periodically establishes cost savings targets at the beginning of a performance evaluation period, then compares my actual performance levels to targets in my performance appraisal.	
MOTIV2	Cost savings goals in my performance appraisal influence my decision to use a reverse auction.	
MOTIV5	Reverse auctions help me attain goals that are part of my performance evaluation.	
	Selection Criteria (I=5, F=4)	0.78
SELCRIT1	For the reverse auction, a supplier's past performance record was less important than price.	
SELCRIT2	For the reverse auction, a supplier's technical capabilities were less important than price.	
SELCRIT3	Low price was the most important selection criterion.	
SELCRIT4	For this reverse auction bidding event, obtaining a low price was most important.	

[a] I = Initial number of scale items, and F = final number of scale items after measure purification

[b] All responses were obtained using 7-point Likert-type scales.

About The Author

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